

of engine is very suitable. It is only fair to remark that most steam consumption figures for Uniflow engines are based upon indicated horse-power, the consumption per brake horse-power not being apparently available, so that a comparison with other types, the performance of which has been frequently ascertained, is not easily made.

The adoption of this type has entailed little alteration in general design or of details, with the exception, of course, of the cylinder, piston, and the bedplate, which is generally made more massive to resist the higher initial steam load, owing to all the work being done in one cylinder. Two bearings are usually provided, and the overhung crank is abandoned in favour of the double-web type. Uniflow engines for industrial purposes have hitherto been of the horizontal type only.

The advantages in economy given by superheating have long been known, but it is only in comparatively recent years that it has come into general use for large stationary engines. This is due to the adoption of mineral cylinder oils which resist the effect of high temperature much more than the animal and vegetable oils formerly used, and which gave trouble by carbonization, causing cutting and wear in the valve-chests and cylinders.

The use of superheat has necessitated considerably more attention being given to the design of cylinders and valves, in order to minimize the distorting effect of high temperatures upon irregularly shaped castings. Simplicity and symmetry are the guiding considerations. For the same reason large rubbing surfaces are avoided. Corliss as well as piston valves of the usual positive-driven type have been to a very large extent replaced by the drop-valve type.

The full inlet pressure of the steam acts upon the back of the Corliss valve, and when in the closed position presses it against its seat with great force. Considerable power is therefore required to drive it, and even when its lubrication is specially designed, the risk of cutting the faces is very great. The piston-valve, whilst being perfectly balanced against steam pressure, also has a large contact surface, and unless the working clearance be made ample, especially in the case of solid

valves, it is always possible that a little distortion may give rise to similar trouble, whilst the increased clearance causes steam leakage. When rings are used in order to secure tightness, carbonization of the oil may cause them to become fixed in their grooves, and cutting, followed by seizing, may occur.

With the drop valve this risk is entirely removed, and tightness, the essential quality of a valve, is obtained without risk of seizing. The valve is almost perfectly balanced, and, owing to the spindle being of small diameter and the stuffing-box of special design, it is almost frictionless. The power required to operate the valves and gear is therefore negligible. The position of the valves with regard to the cylinder inlet is not complicated by consideration of other points in design, such as the position of the bearings and eccentrics on the shaft, and the ports can therefore be extremely short, reducing volumetric clearance to a minimum. This is also a good feature of Corliss valves. Sometimes piston drop-valves are used, working